REMARKS

The applicants request reconsideration and allowance of claims 1-12.

Telephone Interview

The applicants express their appreciation to Examiner Manoharan for the kind courtesy of responding to the applicants' June 5, 2003 request for a Telephone Interview by offering a Telephone Interview on the earliest date that the Examiner would conduct a telephone interview, July 2, 2003 at 10:30 am. Although the applicants gratefully accept the Examiner's offer, it is believed that an earlier interview could have advanced the prosecution of the present application. Because the application is currently under Final Rejection, the applicants cannot defer the present submission for nearly four weeks, but do reserve the option of filing a Supplemental Response after the Telephone Interview. If the Examiner reviews the enclosed Amendment After Final prior to July 2, 2003 and would like to discuss this response, a possible Examiner's Amendment to place all claims in condition for allowance, or other aspects of this matter while it is still fresh in the Examiner's mind, the applicants are amenable to an earlier Telephone Interview. Of course, if the Examiner decides that the application is now in condition for allowance for the reasons set forth below, the Telephone Interview will be moot.

The Present Amendment Should Be Entered

The present Amendment After Final addresses only issues under 35 U.S.C. § 112, first or second paragraph. Accordingly, the present amendment raises no new grounds of rejection, requires no further consideration of the merits, and places the application in better condition for appeal by simplifying the issues. The applicants are more than happy to discuss clarifying amendments at the interview to emphasize the arguments presented below. However, because proposing clarifying amendments to the claims in an Amendment After Final

would jeopardize its entry, such proposed amendments are not appropriate at the present time.

Status of the Claims

Claims 6 and 8 stand rejected under 35 U.S.C. § 112, first paragraph.

Claims 1, 2, 4, and 11-12 stand rejected under 35 U.S.C. § 103 as being unpatentable over El-Allawy (US 4,698,136) or Blanghetti (US 5,930,998).

Claims 3, 5-7, 9, and 10 stand rejected under 35 U.S.C. § 103 as being unpatentable over Hohmann (US 4,981,555) or Ryham (US 5,246,541).

In light of the Examiner's comments in the final rejection, the applicants would like to discuss how the Examiner is applying **Hohmann and Ryham**. The Office Action rejects claims 3, 5-7, 9, and 10, on either Hohmann or Ryham taken alone. Yet, the Examiner states that she is not citing either of these references as showing removing dissolved gases from the liquid. It almost sounds as if she is intending to apply Hohmann and Ryham as teaching references, possibly to teach modifications to El-Allawy or Blanghetti?

35 U.S.C. § 112, First Paragraph Rejection

The applicants do not understand the Examiner's assertions that the present application does not disclose or provide support for maintaining the primary product water vapor separate from the separated gases and look forward to discussing this rejection in greater detail at the Telephone Interview to understand her reasoning more completely.

The present application focuses on a falling film evaporator. Falling film evaporators receive water at their upper end and generate the product vapor which is discharged at their **lower end** (page 1, lines 24-26). See Ryham (US 5,246,541), Hohmann (US 4,981,555), and McCabe & Smith (Unit Operations of Chemical Engineering, page 433), all of record. The present application removes the

separated gases from the **upper end** of the assembly at outlets **5** (page 4, line 5). That is, the product water vapor is discharged from one end of the device and the separated gases are discharged from the opposite end. The present application repeatedly emphasizes that an intent or purpose of the device is to produce water vapor from which atmospheric gases have been removed. Note lines 1-4 of the abstract, page 1, lines 8-11, page 2, lines 22-25, etc.

Claim 6 has been amended to parallel the language of page 2, lines 22-25 more closely. The applicants are also amenable to paralleling the language of page 3, line 4, of the present application more closely, if the Examiner prefers.

The applicants look forward to the Telephone Interview at which the Examiner's rejection can be discussed in greater detail and the applicants can come to understand the basis of the rejection and how to address it in a Supplemental Response.

The Present Application

In the present application, feed water which contains dissolved gases, mainly atmospheric gases, is fed into the device to produce a clean water vapor product that is free of dissolved gases (Abstract, lines 1-4; page 1, lines 8-16; etc.) This is to be distinguished from El-Allawy and Ryham, which have a feed liquid and produce a primary product liquid.

Very briefly summarized, feed water is sprayed by a nozzle **3** onto the upper surfaces of a falling film evaporator. This spraying operation, itself, releases the dissolved gases from the feed water (page 3, line 2). The separated gases are discharged at outlets **5** (page 4, line 5). In this manner, the gases are removed with the feed water concurrently with distributing the feed water over the tube bundle of the falling water evaporator (page 2, lines 20-25). Because the liquid phase distributed as droplets reach the evaporator channels in a very short time, none of the separated gases are redissolved into the feed water before the evaporation starts (page 3, lines 3-5). The water sprayed into the vertical evaporator

channels of the falling water film evaporator are vaporized, discharging water vapor or steam from the lower end of the falling tube evaporator (page 1, lines 21-26). In this manner, the separated gases are discharged through outlets **5** at the top of the evaporator system separately from the water vapor or steam which is discharged from the bottom of the evaporator.

The References of Record

El-Allawy uses a different separation mechanism to remove salts, hydrocarbons, and iron ions from water, i.e., controlled partial expansion. Volatile hydrocarbons are separated from the water at a degasser **9**. The degassed water is sprayed **15** over an electrically heated (column 3, line 23) heat exchanger **16** which boils off both hydrocarbons and water vapor. Because the degasser **9** removed the volatile gases, there should be no volatile gases to separate at the spray nozzles **15**. El-Allawy does not assert any separating takes place at the nozzles or even in the evaporator **14**. Rather, it takes place downstream. Specifically, the water and hydrocarbon vapors are compressed **19** and fed through the heat exchanger **16** and a separator **22** to effect a controlled partial expansion (column 3, lines 65-68). The non-compressible vapors, i.e., the hydrocarbon vapors, do not condense, but the condensible vapors, i.e., water vapor, does (column 3, lines 49-56). Thus, the heat exchanger **16** acts as a **condenser** for the product water to separate the water from hydrocarbons. The separator **22** uses the controlled partial expansion to discharge the hydrocarbon gases through pipe **25** and to discharge the purified distillate (water) through pipe **24** to the outlet **28** (column 3, line 56--column 4, line 11). Thus, the separation of waste gases occurs in degasser **9** and separator **22** (with the help of compressor **19**), not the evaporator **40**. Moreover, the evaporator **40** is not a falling film evaporator and does not function as one.

As the applicants understand the Examiner's application of **Blanghetti**, the Examiner is relying on the embodiment of FIGURE 2, with the modification that a falling tube **heat exchanger** is substituted for the packed column **23** of

heat exchanger **22**. Note that Blanghetti's heat exchanger is being used in a **condenser** mode in which the fluid outside the tubes is heated by the fluid inside the tubes and liquid water is discharged as the output product at the lower end of the tubes. This is as opposed to functioning as an evaporator in which the fluid inside the tubes is heated by the fluid outside the tubes and vapor is the output product at the lower end of the tubes. Even with the Examiner's modification and substitution, Blanghetti uses a different dissolved gas extraction technique to generate a product **liquid**. The primary feed water component which is introduced at **2** is heated by a heat exchanger **29** and fed through an outer passage **22** of a falling water **heat exchanger** to a spray nozzle **24**. Waste steam from the condenser **19** (which might actually be an evaporator) is fed through steam inlet **15** into chamber **14** from which the steam rises through the packed column **23** or, with the Examiner's modification, up through the vertical tubes of a falling water **heat exchanger**. In this manner, the sprayed water runs down the walls of the falling water **heat exchanger** (which is not used as an evaporator) as the steam passes up the center of the tubes (and partially condenses). As the steam condenses, it transfers heat to the water flowing through **22** to the spray **24**. The gases removed by the spraying, the gases extracted by the steam, and the steam mix in the space above the heat exchanger and all exit through tube **26** to a separator **3** which condenses the water **8** and passes the other gases through outlet **27**. Thus, the contaminant gases are moved from the system by a condensation operation in separator **3**.

Blanghetti uses two stages of deaeration. First, it uses flash de-aeration as the water is sprayed by nozzles **24** (column 3, lines 16-20). In the second stage, air remaining in the water flowing down the tubes is removed by kinetics, i.e., stripped out by and dissolved in the rising steam. **The water which has fallen or travelled the length of the falling tube evaporator along with condensed steam forms the product**

water 16. The steam and the removed gases both travel together out tube 26 to a condenser/separator 3.

Thus, Blanghetti does not disclose or fairly suggest using a falling water **evaporator** to generate a primary product **vapor**, but rather uses a falling water **heat exchanger** as a condenser to generate primary product **liquid**. Blanghetti's falling water heat exchanger does not produce product vapor. Moreover, the steam which is rising in columns draws gases out of the product water and the gases and the steam are all intermixed and removed together at 26 to be separated further downstream at the separator 3.

In the Office Action, the Examiner states that **Hohmann** and **Ryham** are not applied for "removing dissolved gases from the liquid", because all of the claims against which the Examiner cites these references require such separation, and because no other references were cited in combination with these two references against the claims, it is submitted that these references need not be discussed further. It appears agreed that these two references do not remove dissolved gases from the liquid. If any further discussion of these references is needed, the applicants refer the Examiner to Amendment B.

The Claims Distinguish Patentably Over the References of Record

Claim 1 calls for separating water soluble atmospheric gases from the sprayed feed water. El-Allawy removes volatile gases in separator 9 upstream of the spray nozzles. The liquid at the spray nozzles should be already fully degassed so that separation would not take place at the nozzles.

Claim 1 further calls for discharging the separated atmospheric gases separately from the water vapor. El-Allawy discharges both non-condensible hydrocarbon gases and water vapor together as a mixture from the evaporator **14, 40**. The separation of these two gases takes place downstream after the compressor **19**, by a controlled partial expansion in which the water vapor is condensed and the hydrocarbon vapors are not.

Accordingly, claim 1 distinguishes patentably and unobviously over El-Allawy.

Although Blanghetti may separate dissolved gases adjacent the spray nozzles **14**, such spray nozzles are intermixed with the steam rising through the falling water **heat exchanger** and discharges the mixture of dissolved gases and steam through outlet tube **26**. Separation of the dissolved gases from the steam takes place by condensing the steam at separator **3**.

Moreover, claim 1 calls for a method which discharges water vapor with reduced atmospheric gas contamination through lower ends of a falling film **evaporator**; whereas, Blanghetti discharges liquid water from lower ends of a falling water **heat exchanger**.

Because both El-Allawy and Blanghetti generate a different output product, liquid water rather than water vapor, and separate water soluble gases in a different way, it is submitted that claim 1 distinguishes patentably and unobviously over the references of record.

Claim 2 calls for an arrangement of vertical evaporator channels which convert water passing therethrough into vapor. El-Allawy **condenses** water vapor flowing through heat exchanger **16** to separate hydrocarbons from water by controlled partial expansion. Blanghetti passes water vapor through the tubes of the falling tube heat exchanger of the FIGURE 2 modification, but does not convert the water into water vapor. Rather, the cool liquid outside of the tubes on its way to the spray nozzles keeps the water in the tubes cool and absorbs heat from the extraction steam which is passing up the tubes. Rather than evaporating the feed water, the cooler liquid on the outside of the tubes which is heated by the steam probably causes partial condensation of the steam, i.e., the falling water heat exchanger of Blanghetti is functioning not as an evaporator, but as a condenser.

Claim 2 further calls for the separated gas to be removed from a separated gas outlet prior to the spray droplets entering the upper end of the evaporator channel arrangement reducing dissolved gas contamination in the vapor. El-Allawy

does not reduce dissolved gas contamination of a vapor. Rather, the only gas or vapor produced by El-Allawy is the separated gas. The only vapor in Blanghetti is intermixed with the separated gas and discharged together through outlet **26** as an intermediate step of the separation product. Thus, the separated gases and the steam are not separated prior to entering the falling water evaporator tubes, but are intermixed at this location. It might be noted that Blanghetti separates the separated gases from the steam in condenser **3** by condensation to produce liquid water and separated gases.

Accordingly, it is submitted that **claim 2 and claims 3-5 dependent therefrom** distinguish patentably and unobviously over the references of record.

Claim 3 depends from claim 2 and also calls for separation of dissolved gases from feed water. Because the Examiner concedes that neither Hohmann nor Ryham which are applied against claim 3 teach the separation of gases from feed water, it is submitted that **claim 3 and claim 5 dependent therefrom** distinguish patentably and unobviously over the references of record.

Claim 6 calls for separating atmospheric gases from water. Because the Examiner has conceded in the last Office Action that neither of the applied references, Hohmann or Ryham disclose such separation, it is submitted that claim 6 and claim 7 dependent therefrom distinguish patentably and unobviously over Hohmann and Ryham.

Further, claim 6 calls for evaporating the water from which the atmospheric gases have been removed in the spraying operation in the vertical evaporation channels. El-Allawy condenses rather than vaporizes water in heat exchanger tube **16**. Blanghetti does not evaporate the water sprayed into the vertical evaporation channels, but rather cools that water and partially condenses an extracting steam which is rising in the columns to intermix and dissolve separated gases with the rising water vapor. In this manner, water vapor with an **increased** atmospheric gas contamination is generated and discharged at **26**.

Accordingly, it is submitted that **claim 6 and claim 7 dependent therefrom** distinguish patentably over the references of record.

Claim 8 calls for a falling film evaporator. The heat exchanger of El-Allawy is not a falling film evaporator. The falling film heat exchanger of Blanghetti is not an evaporator, but rather a condenser.

Claim 8 calls for product water to enter upper ends of the channels and vaporized product vapor to exit the lower ends of the channels. In El-Allawy, to the exact opposite, water vapor enters the upper end of heat exchanger tube **16** and condensed water exits the lower end. In Blanghetti, product water enters the upper end of the channels and product water exist the lower end. Extraction steam enters rather than exits the lower end and exits the upper end.

Accordingly, it is submitted that **claim 8 and claims 9-10 dependent therefrom** distinguish patentably and unobviously over the references of record.

Claims 9-10 stand rejected only as being obvious over either one of Hohmann or Ryham. Because the Office Action of April 11, 2003 concedes that neither shows removing dissolved gases from the liquid, it is submitted that the requirement of parent claim 8 for atmospheric gases to be separated from water droplets is not met by the references. Accordingly, it is submitted that **claims 9-10** distinguish patentably and unobviously over the references of record.

Claim 11 calls for spraying feed water to simultaneously separate nitrogen, oxygen, carbon dioxide, and other dissolved water soluble atmospheric gases from feed water and distributing the feed water over upper ends of vertical evaporation tubes. El-Allawy calls for removing hydrocarbons rather than atmospheric gases, for removing the volatile hydrocarbons before the water is sprayed, and for distributing the sprayed feed water over the exterior of neither an upper nor lower end of heat exchanger tubes **16**.

Claim 11 calls for passing the feed water from which soluble gases have been separated through the vertical

evaporation channels and converting at least a portion of the feed water to steam. To the contrary, El-Allawy passes water vapor into heat exchanger tube **16** and condenses it. Likewise, Blanghetti does not evaporate the feed water of the vertical evaporation channels. Rather, steam from another source passes up through the channels to extract soluble gases. Because a cooler fluid surrounds the vertical channels, the feed water is maintained liquid and the surrounding water extracts heat from the steam by condensation.

Further, claim 11 calls for discharging the steam separate from the separated atmospheric gases. By contrast, El-Allawy discharges liquid water rather than steam. Blanghetti uses the steam to strip dissolved gases from the feed water to form a material-kinetic extraction of the atmospheric gases from the feed water into the steam. Thus, intermixing the steam and the atmospheric gases is a critical part of the Blanghetti separation process. Accordingly, it is submitted that **claim 11** distinguishes patentably and unobviously over the references of record.

Claim 12 calls for a plurality of heated vertical evaporation tubes which receive liquid feed water at upper ends and discharged steam at a lower end. Just the opposite, heat exchanger tube **16** of El-Allawy receives water vapor at its upper end and discharges liquid water at its lower end. Also just the opposite, Blanghetti receives steam at the lower end of the tubes and discharges steam at the upper end of the tubes while concurrently introducing liquid feed water at upper ends and discharging liquid water at the lower ends.

Claim 12 calls for a means for removing the steam separate from the liberated water soluble atmospheric gases. The steam or water vapor generated in the evaporator **14, 40** of El-Allawy is discharged intermixed with the contaminant hydrocarbons, not separately. The only steam in Blanghetti exits the upper ends of the vertical heat exchanger tubes and is purposely intermixed with the water soluble atmospheric gases to carry them to a condenser **3**. The output of the condenser **3** is not steam, but liquid water and separated gases.

Accordingly, it is submitted that claim 12 distinguishes patentably and unobviously over the references of record.

CONCLUSION

In conclusion, in the present application, spraying the feed water over the inlet end of a falling tube evaporator simultaneously separates dissolved gases and distributes the feed water evenly over the input tube ends of the falling water evaporator tubes in which the falling water film is heated and vaporized to produce an output vapor with a lower dissolved gas concentration than the feed water. By contrast, **El-Allawy** uses the evaporator **14** to generate a mixture of water vapor and non-condensible hydrocarbon vapors which are separated downstream at **22** using controlled partial expansion. Volatile hydrocarbons were removed upstream of the evaporator at **9**. **Blanghetti** talks about using a packed column or falling film **heat exchanger**, but does not use either the packed column or the falling film heat exchanger **11** as an **evaporator**. In a typical falling film evaporator (note **Ryham**, **Hohmann**, or **McCabe & Smith**), water is fed into the falling tubes **12** and is heated by steam that surrounds the tubes to evaporate the falling water, producing steam or water vapor at the lower end of the tubes. Just the opposite, Blanghetti passes steam **up** the center of the tubes to: (1) extract gases from water flowing down the inside of the tubes, and (2) to preheat the feed water passing through the region **22** around the tubes. The heat flow is in the opposite direction in Blanghetti than it would be in an evaporator.

The applicants look forward to the opportunity to discuss these differences with the Examiner in an interview and arrive at appropriate language for the claims such that they distinguish clearly over the cited references.